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Edition 1.1
(1988-10)

Indian Standard

SPECIFICATION FOR READY MIXED PAINT, FINISHING, EXTERIOR, FOR SHIPS

(Incorporating Amendment No. 1)

UDC 667.638.6 : 629.12.06

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

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IS : 6951 - 1973

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SPECIFICATION FOR READY MIXED PAINT, FINISHING, EXTERIOR, FOR SHIPS

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Indian Standard

SPECIFICATION FOR READY MIXED PAINT, FINISHING, EXTERIOR, FOR SHIPS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 7 March 1973, after the draft finalized by the Paints and Allied Products Sectional Committee had been approved by the Chemical Division Council.

0.2 On a specific request the feasibility of aligning JSS 3036 'Specification for paint, PFU, finishing, exterior, synthetic (brushing, spraying), issued by the Department of Standardization, Ministry of Defence, Government of India with any of the existing Indian Standard was examined. It was felt that a new Indian Standard may be prepared drawing assistance from JSS 3036 and other Defence Specifications on the subject to cater to the needs of Navy and Merchant Shippings.

0.3 This standard contains clause **3.6** which calls for an agreement between the purchaser and the supplier.

0.4 Considerable assistance has been derived from the following overseas publications in the preparation of this standard:

I-GP-48c-1962 Primer, marine, for steel. Canadian Government Specifications Board, Canada.

I-GP-61d-1968 Enamel, alkyd, marine, exterior. Canadian Government Specifications Board, Canada.

SIS 185111 European scale of degree of rusting for anti-corrosive paints. Sveriges standardiseringskommission (Sweden).

0.5 This edition 1.1 incorporates Amendment No. 1 (October 1988). Side bar indicates modification of the text as the result of incorporation of the amendment.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes requirements and methods of sampling and test for ready mixed paint, finishing, synthetic, exterior, for ships. The material is used in painting system for finishing of the weather work areas of ships.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 1303-1963* and under 2 of IS : 101-1964† shall apply.

3 REQUIREMENTS

3.1 Composition — The material shall be manufactured with ingredients mixed in suitable proportions as given below:

a) *Pigments* — The pigments shall consist of minimum 80 percent titanium dioxide (conforming to Type R of IS : 411-1968‡) and maximum 5 percent zinc oxide (conforming to IS : 35-1950§). In addition, it may contain suitable extenders and tinters not exceeding 15 to 20 percent.

b) *Varnish Medium* — It shall consist of a drying oil modified alkyd resin varnish of the long oil type.

c) Petroleum hydrocarbon solvents (conforming to IS : 1745-1966||) and driers (conforming to IS : 385-1962¶) shall be added in suitable proportions.

3.2 Resistance to Natural or Artificial Sea Water — The material, when tested as prescribed in Appendix A for 14 days, shall pass the test.

3.3 Resistance to Intermittent Salt Spray — The material, when tested as prescribed in Appendix B for a period of 21 days, shall pass the test.

3.4 Water Content — If water is suspected, the material shall not contain water more than 0.5 percent when tested as prescribed in **14** of IS : 101-1964†.

3.5 Mass in kg/10 litres — The mass in kg/10 litres of the material shall be within ± 3 percent of the approved sample when tested as prescribed in **25** of IS : 101-1964†.

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*Glossary of terms relating to paints (*revised*).

†Methods of test for ready mixed paints and enamels (*second revision*).

‡Specification for titanium dioxide for paints (*first revision*).

§Specification for zinc oxide for paints.

||Specification for petroleum hydrocarbon solvents (*first revision*).

¶Specification for liquid driers for paints (*revised*).

3.6 *Clause deleted*

3.7 Lead Content — The material shall contain lead or compounds of lead not more than 0.3 percent by mass, expressed as metallic lead when tested as prescribed in **29** of IS : 101-1964*.

3.8 Compatibility with Undercoat — A single coat of the material, when applied to a steel panel primed with zinc chrome primer (conforming to IS : 104-1962†) and a coat of undercoat (conforming to IS : 6948-1973‡), shall not cause lifting or appreciable softening of the undercoat when examined immediately after application of the material.

3.9 Durability

3.9.1 *Registered Sample*

3.9.1.1 When prepared and tested as prescribed under **C-3**, a general breakdown of the film, prepared from the registered sample of the material, shall not occur in less than 12 months.

3.9.1.2 A film of the registered sample shall be prepared and tested, as prescribed under **C-4**, in an accelerated weathering apparatus for a period of 15 days and a complete record of its performance maintained.

NOTE — As a precaution against inadvertent accidents, it is recommended that the outdoor exposure test (*see* **C-3**) and the accelerated weathering test (*see* **C-4**) are carried out in duplicate.

3.9.2 *Sample from Bulk Supply* — A film of the material prepared from a representative sample from bulk supply as described in Appendix C and tested in the accelerated weathering apparatus (*see* **C-4**) shall be not materially different in performance as compared with the record of the film of the registered sample. The film shall be examined daily for a period of 15 days.

3.10 The material shall also conform to the requirements given in Table 1.

4. PACKING AND MARKING

4.1 Packing — The material shall be packed in steel containers as agreed to between the purchaser and the supplier.

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*Methods of test for ready mixed paints and enamels (*second revision*).

†Specification for ready mixed paint, hrushing, zinc chrome, priming (*revised*).

‡Specification for ready mixed paint, undercoat, synthetic, for ships.

TABLE 1 REQUIREMENTS FOR READY MIXED PAINT, FINISHING, SYNTHETIC, EXTERIOR, FOR SHIPS

(*Clause* 3.10)

SL No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST (REF TO CL NO. IN IS: 101-1964*)
(1)	(2)	(3)	(4)
i)	Drying time:		
	a) Surface dry	Not more than 6 hours	7.1, 7.2 & 7.3
	b) Hard dry	Not more than 18 hours	
ii)	Consistency	Smooth and uniform and suitable for brushing or spraying when thinned suitably	7.4
iii)	Finish	Smooth and glossy	7.5
iv)	Colour	Close match to the specified IS colour	11
v)	Fastness to light	Not inferior to the approved sample	12
vi)	Scratch hardness	No scratches as to show the bare metal	15.1
vii)	Flexibility and adhesion	No damage or detachment of the film	16
viii)	Flash point, *Min*, °C	30	24
ix)	Keeping quality	Not less than 1 year	31
x)	Wet opacity	Between -10 percent and +20 percent of the approved sample	10

*Methods of test for ready mixed paints and enamels (*second revision*).

4.2 Marking — The containers shall be marked with the following:

a) Name of the material;
b) Manufacturer's name and his trade-mark, if any;
c) Volume of the material;
d) Month and year of manufacture; and
e) Batch or Code No.

4.2.1 The containers may also be marked with the IS1 Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. SAMPLING

5.1 The representative samples of the material shall be drawn as prescribed in **3** of IS : 101-1964*.

6. TEST METHODS

6.1 The tests shall be conducted as prescribed in IS : 101-1964* and Appendices A to C. References to relevant clauses of IS : 101-1964* are given in col 4 of Table 1 and **3.4** to **3.7**; and to the Appendices in **3.2, 3.3** and **3.9.**

6.2 Quality of Reagents — Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1960†) shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

APPENDIX A

(*Clause* 3.2)

RESISTANCE TO NATURAL OR ARTIFICIAL SEA WATER

A-0. GENERAL

A-0.1 Outline of the Method — The painted panel is immersed in natural or artificial sea water for specified period and paint film examined for any deterioration.

A-1. COMPOSITION OF NATURAL SEA WATER

A-1.1 The natural sea water shall have a *p*H of 7.9 to 8.3 and a chlorinity of not less than 17 parts and salinity of 31 parts per 1 000.

NOTE — The chlorinity and consequently salinity of natural sea water on the Indian coast line is subject to variations due to the monsoon. Dilution occurs during this period, lowering these values considerably. This period usually varies from 3 to 4 months during the year. In the other months, salinity is equal to or even higher than the artificial sea water but seldom exceeds 36 to 37 parts. This rise in salinity, however, has not a very significant effect on the test.

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*Methods of test for ready mixed paints and enamels (*second revision*).

†Specification for water, distilled quality (*revised*).

A-2. COMPOSITION OF ARTIFICIAL SEA WATER

A-2.1 Dissolve the specified amounts of the following salts and make up with freshly distilled water to give 1 kg of the solution:

Salt	*Mass,* g
Sodium chloride ($NaCl$)	23.476
Magnesium chloride ($MgCl_2$)	4.981
Sodium sulphate (Na_2SO_4)	3.917
Calcium chloride ($CaCl_2$)	1.102
Potassium chloride (KC1)	0.664
Sodium bicarbonate ($NaHCO_3$)	0.192
Patassium bromide (KBr)	0.096
Boric acid (H_3BO_3)	0.026
Strontium chloride ($SrCl_2$)	0.024
Sodium fluoride (NaF)	0.003
	34.481
Water to Make:	1 000.000

A-2.1.1 The artificial sea water thus prepared on thorough aeration produces a *p*H between 7.9 and 8.3, which is most suitable for the test.

A-3. PROCEDURE

A-3.1 Preparation of Test Panels — Clean mild steel panels of size 150 × 100 × 1.25 mm, and conforming to Type DD of IS : 513-1963*. Uniformly burnish the panel with No. 0 emery paper and degrease. Apply a coat of the primer (conforming to IS : 104-1962†) on both the sides to give a dry film mass in accordance with **6.4** of IS : 101-1964‡ and allow to dry for 24 hours. Apply a coat of undercoat (conforming to IS : 6948-1973§) and allow to dry for 24 hours. Finally apply a coat of the material and allow to dry for 7 days. Seal the edges of the panel with wax up to a depth of 6 mm by dipping in molten wax.

A-3.2 Immerse the test panels at room temperature for a period of 14 days in natural or artificial sea water which is aerated by a continuous slow stream of air free from oil or grease. Examine the

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*Specification for cold rolled carbon steel sheets (*revised*).

†Specification for ready mixed paint, brushing, zinc chrome, priming (*revised).*

‡Methods of sampling and test for ready mixed paints and enamels (*second revision*).

§Specification for ready mixed paint, undercoat, synthetic, for ships.

panels at the end of 14 days visually for signs of deterioration of the system. Carefully remove a portion of the system with a suitable paint remover and examine the substrate for any corrosion.

A-3.3 The material shall be deemed to have passed the test if the panel does not show any sign of corrosion and not more than slight blistering.

APPENDIX B

(*Clause* 3.3)

RESISTANCE TO INTERMITTENT SALT SPRAY

B-0. GENERAL

B-0.1 Outline of the Method — The painted panels are subjected to intermittent salt spray for 21 days and paint film examined for any deterioration.

B-1. APPARATUS

B-1.1 The apparatus illustrated diagrammatically in Fig. 1 and 2 consists essentially of a chemically inert container with a close fitting cover in which a fine mist of the spray solution is produced through an atomizer in such a way that:

a) this mist is produced 7 hours each day excepting Saturdays and Sundays;

b) panels supported on non-metallic supports with the test face upwards at an angle of approximately 15° to the vertical are evenly coated with droplets of the solution;

c) the salt spray is prevented by a baffle from impinging directly on the test faces of the panels; and

d) salt solution drained from the test panels is not recirculated.

B-2. SALT SPRAY

B-2.1 The spray solution shall have a composition as specified in **A-2.1.**

B-3. PROCEDURE

B-3.1 The test panels shall be prepared as prescribed in **A-3.1.** One side will have a three-coat system. Expose the painted panels to a baffled spray of the salt solution. At the end of 21 days, the panels

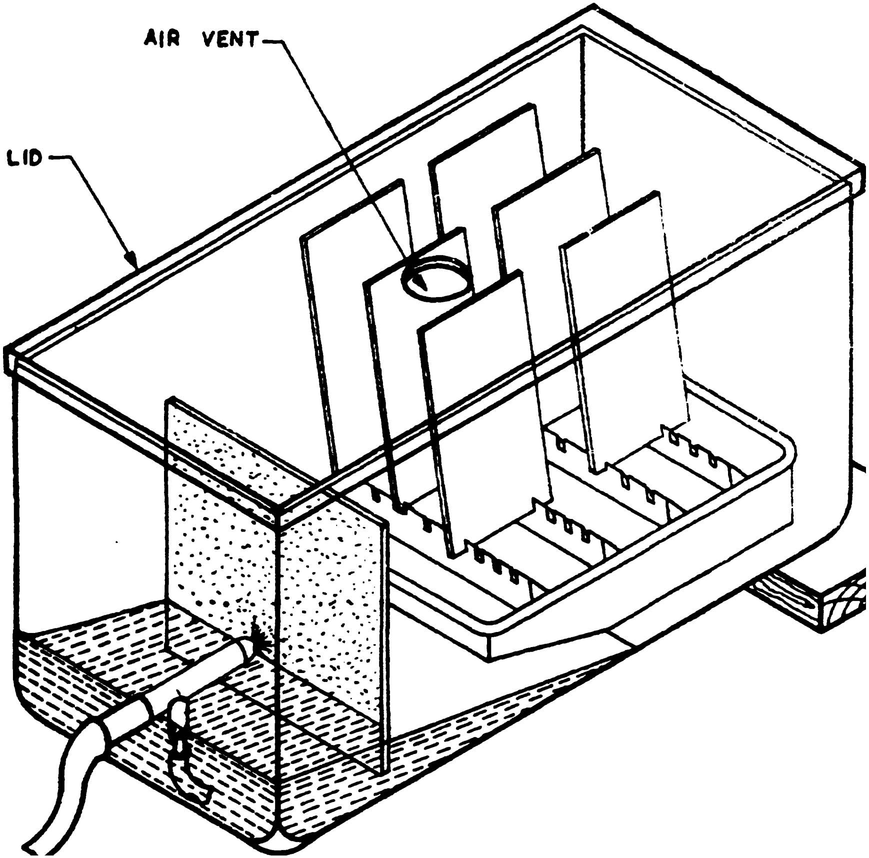

FIG. 1 SALT SPRAY APPARATUS

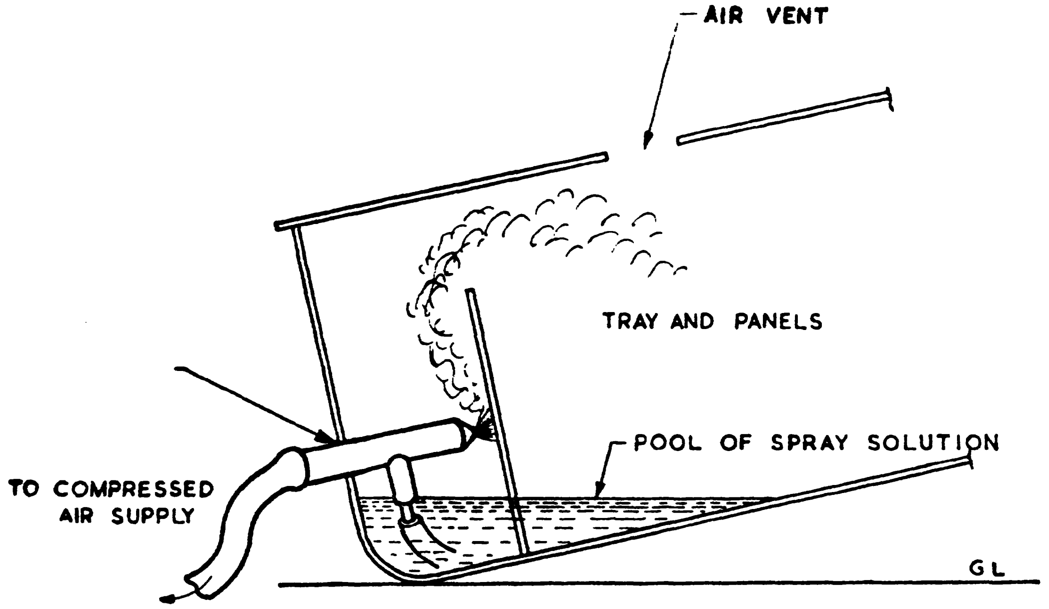

FIG. 2 PART SECTIONAL VIEW OF SALT SPRAY APPARATUS

shall be examined visually for any deterioration of the paint film. Carefully remove a portion of the system with a suitable paint remover and examine the substrate for any corrosion.

B-3.2 The material shall be deemed to have passed the test if the panel does not show any sign of corrosion and not more than slight blistering.

APPENDIX C

(*Clause* 3.9)

DETERMINATION OF DURABILITY

C-0. GENERAL

C-0.1 Outline of the Method — The durability of the material is determined by ascertaining actual behaviour of suitably prepared test panels in normal outdoor exposure test for a specified period and evaluating the results of this exposure by a suitable method of rating for various characteristics of film of the material. Apart from this the material is also evaluated by an accelerated weathering test wherein a prepared panel is subjected to controlled exposure of heat, light and water in an artificial weathering apparatus.

C-1. TEST PANELS

C-1.1 The panels shall be mild steel plate, 1.6 mm thick and free from surface defects. Panels for the outdoor exposure test shall be 300 × 300 mm in size and for the accelerated weathering test 150 × 75 mm. The panels shall be cleaned as prescribed under **5.2.1** of IS : 101-1964* and the back and edges of the panels shall be protected with two coats of a suitable paint.

C-2. PREPARATION OF TEST PANELS

C-2.1 In the painting procedure outline under **C-2.2,** the air-drying of the films shall be done at room termperature as defined under **2.9** of IS : 101-1964* and at relative humidity of not more than 70 percent.

C-2.2 The surface of the test panels to be exposed shall be prepared as follows:

a) Apply one coat of ready mixed paint, zinc chrome, priming (conforming to IS : 104-1962†), and allow to air-dry for 24 hours.

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*Methods of test for ready mixed paints and enamels (*second revision*).

†Specification for ready mixed paint, brushing, zinc chrome, priming (*revised*).

b) Rub the panel lightly with waterproof emery paper No. 220/240. Apply by appropriate method (brushing/spraying) one coat of the undercoat (conforming to IS : 6948-1973*) and allow to air-dry for 24 hours.

c) Rub wet with waterproof emery paper No. 220/240, wash and wipe off water, apply by appropriate method (brushing/spraying) one coat of the finishing conforming to this standard when this surface is dry and allow to air-dry for 48 hours.

d) Rub wet with waterproof emery paper No. 320, wash and wipe off water, apply by appropriate method (brushing/spraying) a second coat of the finishing material when the surface is dry, and allow to air-dry for 7 days before subjecting to exposure test.

C-3. NORMAL OUTDOOR EXPOSURE TEST

C-3.0 Subject the samples for registration and the tender samples, if supplied, to normal outdoor exposure test in the manner described under **C-3.1.**

C-3.1 Expose in open the test panels, prepared in the manner prescribed under **C-1** and **C-2** in duplicate in a vertical position facing south. Commence the exposure not earlier than the third week of January and not later than the first week of April.

C-3.1.1 Examine the condition of the exposed films at monthly intervals for gloss retention and at bi-monthly intervals for the other characteristics given below:

a) Colour,
b) Checking and cracking,
c) Chalking, and
d) Spotting.

C-3.1.2 For the above examinations, wash the right hand half of the surface of the two test panels by pouring water and then wiping with a soft cloth or chamois leather (*see* IS : 10l7-1966†). Adequate time for cooling of the panels to room temperature shall be allowed prior to washing. Examine the same half of the test panels at each examination. As an aid in the examination, a magnifying glass may be used, but the evaluation shall be based on an assessment with the unaided eye. At the end of the stipulated period for durability test, examine the two halves of the test panels. The sample shall be considered satisfactory if the material surface underneath as well as condition of the film in both the halves, the one washed periodically and the one washed only for the final examination is satisfactory by the method of evaluation described under **C-3.2**. Stray film failure due to extraneous causes other than climatic shall be ignored.

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*Specification for ready mixed paint, undercoat, synthetic, for ships.

†Specification for chamois leather (*first revision*).

C-3.2 Method of Rating — The film of an unexposed test panel shall be rated with the following basic values for the respective characteristics:

a) Possessing high gloss	25
b) Possessing correct colour	25
c) Freedom from checking and cracking	35
d) Freedom from chalking	10
e) Freedom from spotting	5
	100

NOTE — The initial rating of film may be 100 or less according to the condition of gloss and colour, the rating for freedom from checking and cracking, chalking and spotting being always the maximum in the case of unexposed films.

C-3.3 Evaluation of Exposed Films — In recording the condition of exposed films at each examination, express the observed relative values of different characteristics in percentages of the basic value allotted to each characteristic under **C-3.2**. The allotment of performance value should be multiples of 10. For arriving at an assessment, multiply the basic value for each characteristic (*see* **C-3.2**) by the percentage awarded for the performance in the test and divide the product so obtained by 100 to obtain the percentage award for the observed value of each characteristic. Take the sum total of these resulting values as the overall assessment.

C-3.3.1 Table 2 is intended to serve as an example for the assessment of a film of the material after exposure.

C-3.4 Results of Exposure — Reckon the period for the general breakdown of the exposed film from the date of commencement of exposure to the time when the overall assessment falls below 50 percent or when the performance value of any one characteristic falls below 25 percent of the basic value adopted for that characteristic. In Table 2 although the overall assessment is 54.5 percent, yet the film is to be regarded as having generally broken down, because the performance value of chalking has fallen below 25 percent of its basic value.

C-3.5 Protection Against Corrosion — After the exposure of the film is discontinued, examine for corrosion of the metal surface of the panel underneath by removing film at 5 different places, one in the centre and one each at 4 different places near the 4 corners about 50 mm away from either edge. The paint film shall be removed by solvent type paint remover. When the film is softened by the paint remover, it shall be removed by gently rubbing with cotton swab or waste jute taking care to remove adhering film of primer or undercoating or both. After removal of the film, the exposed metal shall be covered by thick mineral oil or vaseline. Localized corrosion or rust spots shall not constitute a cause of failure. To satisfy the requirements of this standard, the metal surface shall be otherwise free from corrosion.

TABLE 2 ASSESSMENT OF A FILM OF THE MATERIAL AFTER EXPOSURE

(*Clause* C-3.3.1 *and* C-3.4)

SL NO.	CHARACTERISTIC	BASIC VALUE	PERFORMANCE VALUE	ASSESSMENT VALUE
(1)	(2)	(3)	(4)	(5)
		percent	percent	percent
i)	Possessing high gloss	25	50	12.5
ii)	Possessing correct colour	25	60	15.0
iii)	Freedom from checking and cracking	35	60	21.0
iv)	Freedom from chalking	10	20	2.0
v)	Freedom from spotting	5	80	4.0
				54.5

NOTE — Other characteristics being found satisfactory, the samples shall not be rejected on the ground of gloss retention being lower than 25 percent, but the gloss retention figure shall be reported.

C-4. ACCELERATED WEATHERING TEST

C-4.1 Accelerated Weathering Apparatus — an artificial weathering apparatus of the carbon arc type for uniform and controlled exposure to the effects of heat, light and water.

C-4.2 Samples for registration shall be tested in duplicate in a suitable accelerated weathering apparatus (*see* **C-4.1**) and samples drawn from bulk supply shall be tested in a similar manner. The test panels shall be prepared as described under **C-2.2**. The requirements of this test shall be taken to have been satisfied if the performance in respect of all the characteristics is similar to the recorded results of the film of the registered sample.

INDIAN STANDARDS
ON
MARINE PAINTS

IS:	
1404-1970	Anti-corrosive paint, brushing, for ships' bottoms and hulls, rod, chocolate or black, as required (*first revision*)
1419-1959	Anti-fouling paint, brushing, for ships' bottoms and hulls, red, chocolate or black, as required
6714-1972	Ready mixed paint, finishing, non-slip, deck
6948-1973	Ready mixed paint, undercoat, synthetic, for ships
6951-1973	Ready mixed paint, finishing, exterior, for ships

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This Indian Standard has been developed by Technical Committee : CDC 8

Amendments Issued Since Publication

Amend No.	Date of Issue
Amd. No. 1	October 1988

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